

CORRES CONTROL
OUTGOING LTR NO

93 RF 10384

EG&G ROCKY FLATS

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August 23 1993

93 RF 10384

Richard J Schassburger
Acting Director
Environmental Restoration Division
DOE, RFO

Attn P Singh

TRANSMITTAL OF THE WETLANDS MONITORING REPORT WSB 336 93

Attached is the Operable Unit (OU) 1 Wetlands Monitoring Report for your review This document is being submitted to the Department of Energy Rocky Flats Office (DOE RFO) in accordance with agreement reached between DOE the Environmental Protection Agency (EPA) and the Colorado Department of Health (CDH) in a meeting on April 1 1993 At this meeting it was agreed that EG&G Rocky Flats Inc (EG&G) would develop a wetland status report annually and submit it to EPA on August 30th each year

If DOE has edits to this report please transmit them to C B Gee by August 27 1993 EG&G will then deliver four copies of the final report to DOE on August 30 1993 for transmittal to EPA and CDH Alternatively if DOE would like EG&G to deliver the reports directly to the agencies on August 30th please notify C B Gee The EPA is the only agency DOE is technically committed to updating on the wetland status but as a courtesy relative to CDH's role in OU 1 EG&G recommends the report be submitted to both agencies

If you have questions please contact C B Gee of Remediation Project Management at extension 8550

WSB
W S Busby
Acting Director
ERM/Remediation Project Management

CBG:dmf

Orig and 1 cc R J Schassburger

Attachment
As Stated

ADMIN RECORD

1068

A-0101 00404

DIST	TR	NC
BENEDETTI R L	X	
BENJAMIN, A		
BERMAN, H S		
BRANCH D B		
CARNIVAL G J		
COPP R D		
DAVIS J G		
FERRERA D W		
HANNI B J		
HARMAN L K		
HEALY T J		
HEDGAHL T		
HILBIG J G		
KIRBY W A		
KUESTER A W		
LEE E M		
MANN H P	X	
MARX G E		
M DONALD M M		
McKENNA, F G		
MONTROSE J K		
MORGAN R V		
POTTER G L		
PIZZUTO V M		
RILEY J H		
SANDLIN, N B		
SHEPLER R L		
STEWART D L		
SULLIVAN M T		
SWANSON E R		
WILKINSON R B	X	
WILLIAMS S (ORC)		
WILSON J M		
ZANE J O		

Gee CB X
Busby WS X
Krause J X

201 File X
CORRES CONTROL x x
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CLASSIFICATION

UCNI	
UNCLASSIFIED	
CONFIDENTIAL	
SECRET	

AUTHORIZED CLASSIFIER
CURRENT CLASSIFICATION
EVALUATION PER
CLASSIFICATION OFFICE
DATE

IN REPLY TO REF CC NO

ACTION ITEM STATUS

☐ OPEN ☒ CLOSED

☐ P R T L

LTR APPROVALS

JSB WSB CBG CBG

ORIG & TYPIST INITIALS

CBG/dmf

OU 1 Wetland Status Report

August 30, 1993

MONITORING REPORT FOR OPERABLE UNIT 1 MITIGATION WETLAND AT ROCKY FLATS PLANT

Background

This monitoring report presents the status of a wetland that was established in Operable Unit (OU) 1 at Rocky Flats Plant (RFP) Colorado as mitigation for a wetland area that was impacted by the OU 1 Interim Action/Interim Remedial Action (IM/IRA). Monitoring of this wetland was requested by the Environmental Protection Agency (EPA) at a meeting held at RFP on April 1 1993. At this meeting it was agreed that 2 000 square feet of wetland should be established with cattails planted on approximately one foot centers and that an 85 / survival rate (0.85 cattails per square foot) would be the minimum acceptable. It was also agreed that a monitoring report would be submitted to EPA and the Colorado Department of Health (CDH) each year by the end of August for a period of five years.

The OU 1 mitigation wetland area at Rocky Flats Plant was planted with a total of approximately 2200 common cattail (*Typha latifolia*) 100 great bulrush (*Scirpus validus*) 100 chair maker's rush (*Scirpus americanus*) and 100 coyote willow (*Salix exigua*). The planting was done on May 6 7 10 and 11 1993. The planting stock was obtained through a local nursery. The nursery obtained cattails from a grower in Montana because locally grown stock was not available within the time that EPA wanted the planting to be completed. The mitigation wetland was evaluated on August 17 1993 to determine the density of cattails and the surface area covered by the cattails.

Planting Materials and Methods

The cattail and willow planting materials consisted of 10 cubic inch containerized stock (containerized tubelings approximately 8" long). The cattail planting stock (Figure 1) consisted of plants that had grown for one season in plastic conical containers. The stems had been cut back to approximately 1 inch and the plants were just breaking dormancy. The great bulrush and chair maker's rush planting material consisted of 2 inch square pots (Figure 2). The cattails were planted in holes made with sharpened broom handles. A tile spade was used to dig holes for planting the great bulrush chair maker's rush and willow. The cattail was the only vegetation that EPA required in the mitigation wetland area. The willow great bulrush and chair maker's rush were planted to add some diversity to the vegetation in the wetland.

At the time of planting the water depth in the lowest (deepest) areas of the mitigation wetland was approximately one foot. Cattails were planted throughout the entire wetland mitigation area even though some of the areas were submerged (Figure 3). The great bulrush and chair maker's rush were planted in isolated pockets among the cattails near the outside edges of the mitigation wetland (Figure 4). The willows were planted just outside the perimeter of the area planted with cattails. The area planted with willows was not included in the total area identified as being successfully revegetated with cattails. The planted material was in very good condition at the time of planting. Approximately 12% of the cattail tubelings did not have adequate root systems developed to hold the planting medium together and appeared to be dead. These were not planted.

Monitoring Materials and Methods

A quadrat sampling method was used to determine the density of the cattails in the mitigation wetland. One half square meter quadrats (one meter x one half meter rectangles) were used to sample the vegetation on August 17, 1993. This quadrat size was considered to be large enough to reduce boundary error to acceptable levels yet small enough that the number of plants within each quadrat was small enough to obtain accurate counts. Density was determined by counting the number of cattails found in each quadrat. The quadrat counts were multiplied by 2 to obtain the density per square meter. This number was converted into a density per square foot to allow comparison with the EPA criteria of planting on one foot centers which would result in an overall density of one cattail per square foot.

The quadrat sampling procedure used to determine the density of cattails in the mitigation wetland is from the Comprehensive Onsite Determination Method as described in both the 1977 Corps of Engineers Wetland Delineation Manual and the 1989 Federal Manual for Identifying and Delineating Jurisdictional Wetlands. This procedure is simply one way of randomly locating quadrats that can be sampled to give an accurate estimate of the overall density within the population of interest. One minor modification to the procedure was necessary. The modification consisted of using six transects instead of the three that were recommended in the manuals. This was necessary in order to get enough sample plots to have a statistically valid sample size without having to overlap several quadrats along each transect.

The sampling procedure involved laying out a baseline perpendicular to the hydrologic gradient. Sampling transects were then laid out perpendicular to the baseline. The transect locations were determined by dividing the baseline into a number of equal segments and using a random number generator to determine the transect location within each segment.

Quadrats were located on observation points along the centerline of the transects by placing one corner of the transect on the observation point and placing one edge of the quadrat adjacent to the transect line. Observation points were located along the transects at a random number generated distance from the edge of the wetland. One half square meter rectangular quadrats were used. Quadrat frames were constructed of half inch PVC pipe.

Initially 6 quadrats were counted. The values obtained from these quadrats were substituted into the following sample size estimation formula for a univariate normally distributed vegetation characteristic. This calculation gave the number of samples that were necessary to obtain a 90 per cent confidence level (10 / chance of error) that the sample mean obtained from the quadrat counts was within 5 / of the actual population mean. By using the following sample size estimation formula it was calculated that 4 additional samples (quadrats) were needed.

$$n = \frac{t^2 s^2}{(kX)^2}$$

n = the number of samples required to obtain the required confidence level and precision

t = the t variable for the sample at the stated level of error

s = the standard deviation of the sample

k = the proportion or precision that the true difference of the sample mean occurs from the population mean
X = the sample mean

The area of the mitigation wetland was determined by placing wire flags around the perimeter of the wetland vegetation to identify the boundary of the surviving planted cattails. The locations of the flags were surveyed and plotted to produce the vegetation map shown in Figure 5. Flags were also used to mark the areas where the great bulrush and chair maker's rush was planted. These areas are also shown in Figure 5. The willows were planted in scattered areas around the perimeter of the mitigation wetland. The locations of individual willows are not indicated in Figure 5.

Results

The results of the wetland planting are shown in Figure 6. The mean density of cattails in the mitigation wetland calculated from the 10 sample quadrats was 33/m² (3.07/ft²). This sample size gave a 90% statistical confidence that the sample mean was within 5% of the population mean.

The size of the area where planted cattails are surviving was determined to be 1860 square feet. This figure represents the area shown in Figure 5 as the area covered with cattails. This area does not include the area of wetland vegetation (primarily cattails, cottonwood saplings and willows in the northwest part of the wetland area) that was already present in the general area before the cattails were planted.

The willows, great bulrush, and chair maker's rush plantings were not sampled with quadrats but they appeared to be doing well at the time the cattails were evaluated. Some great bulrush and coyote willow had also established in areas where they had not been planted.

Discussion

The density of the planted cattails is generally uniform throughout the mitigation wetland. The density is somewhat lower in areas that remained submerged for a period of weeks after planting. Survival was expected to be lower in these areas since the young cattail plants are not able to withstand extended inundation unless the stems are long enough to protrude above the water. Cattails that were planted in the submerged areas also showed a tendency to float up out of the substrate shortly after they were planted. The bentonite bottom substrate in these deeper water areas was the consistency of runny mashed potatoes and was apparently unable to hold all the tubelings in place. These wetter areas appear to be the primary sites where the *Eleocharis* is becoming established. It is not clear whether the reduced density of the cattails influences the location of *Eleocharis* establishment. It is likely that additional cattails will establish in these wetter areas within a short time either as erect shoots developing from rhizomes extending in from nearby planted cattails or as individual plants established from seeds from nearby seed sources.

The density of cattails obtained from the quadrat counts is somewhat higher than would be expected in an area that was planted with approximately one cattail per square foot. Explanations for this increased density include the following:

- (1) The cattails were planted at a slightly higher density than one plant per square foot because not all of the cattails were expected to survive. The higher planting density would have allowed achievement of a one per square foot density even with some mortality. The actual mortality was apparently very low.
- (2) Some of the cattail tubelings sent up more than one vertical stem. It is not clear whether some of the tubelings contained more than one plant or whether single plants (single root systems) sent up more than one vertical stem.
- (3) Some cattails have apparently established from seeds blown in from adjacent seed sources. Some of the cattails that were counted were very small and lacked the remnants of planting medium that were still evident at the bases of many of the larger cattail stems that had obviously been planted. Excavation and examination of the root systems would determine whether these plants have established from seeds but this was not done because it would likely kill the cattails that were excavated.

Wetland vegetation that was already present adjacent to the mitigation wetland area included primarily cottonwood (*Populus sp*) willow (*Salix sp*) and cattail (*Typha sp*) growing in the northwest corner of the wetland. This vegetation does not appear to have been significantly impacted by the mitigation wetland construction. A few cottonwood seedlings have established in the mitigation wetland area adjacent to the larger cottonwoods trees and the cattails in the extreme northwest corner are spreading onto the mitigation wetland.

Other vegetation is naturally recolonizing the wetland. Table 1 gives a list of species that were observed on August 17, 1993 in the mitigation wetland area below the apparent high water mark. Most of these species are represented by scattered individuals. The only vegetation that has become established in any significant numbers is the *Eleocharis* that is colonizing some of the wetter parts of the mitigation wetland. The facultative upland (FACU) and facultative (FAC) species are generally found around the upland edges of the wetland. There are a few scattered individuals of various species found throughout the mitigation wetland but no species has established to the point that it appears to be competing with the planted cattails or taking over the wetland.

Some soil material is eroding off the hillside to the north of the wetland and is beginning to cover some of the cattails that were planted on the north side of the wetland.

TABLE 1

PLANT SPECIES OCCURRING IN OU 1 MITIGATION WETLAND

<u>Scientific Name</u>	<u>Common Name</u>	<u>Indicator Category¹</u>
<i>Agropyron smithii</i>	Western Wheatgrass	FACU
<i>Ambrosia psilostachya</i>	Western Ragweed	FAC
<i>Asclepias viridiflora</i>	Green Milkweed	NL
<i>Bromus inermis</i>	Smooth Brome	NL
<i>Bromus japonicus</i>	Japanese Brome	FACU
<i>Carduus nutans</i>	Musk Thistle	NL
<i>Centaurea diffusa</i>	Knapweed	NL
<i>Chenopodium album</i>	Lamb s quarters	FAC
<i>Chenopodium leptophyllum</i>	Goosefoot	NI
<i>Cirsium arvense</i>	Canada Thistle	FACU
<i>Convolvulus arvensis</i>	Field Bindweed	NL
<i>Conyza canadensis</i>	Horseweed	FACU
<i>Echinochloa crusgalli</i>	Barnyard Grass	FACW
<i>Eleocharis acicularis</i>	Needle Spikesedge	OBL
<i>Eleocharis macrostachya</i>	Spike Rush	OBL
<i>Epilobium ciliatum</i>	Willow Herb	OBL
<i>Euphorbia serpyllifolia</i>	Thyme leaved Spurge	NL
<i>Grindelia squarrosa</i>	Curly top Gumweed	FACU
<i>Helianthus annuus</i>	Common Sunflower	FACU
<i>Hordeum jubatum</i>	Foxtail Barley	FACW
<i>Juncus balticus</i>	Baltic Rush	OBL
<i>Juncus torreyi</i>	Torrey s Rush	FACW
<i>Lactuca serriola</i>	Prickly Lettuce	FAC
<i>Melilotus officinalis</i>	Yellow Sweetclover	FACU
<i>Oenothera biennis</i>	Common Evening Primrose	FACU
<i>Panicum capillare</i>	Witchgrass	FAC
<i>Phleum pratense</i>	Timothy	FACU
<i>Plantago lanceolata</i>	English Plantain	FAC
<i>Plantago major</i>	Common Plantain	FAC
<i>Poa compressa</i>	Canada Bluegrass	FACU
<i>Polygonum aviculare</i>	Knotweed	FACW
<i>Polypogon monspeliensis</i>	Rabbitfoot Grass	OBL
<i>Populus deltoides</i>	Plains Cottonwood	NL
<i>Rumex crispus</i>	Curly Dock	FACW
<i>Salix amygdaloides</i>	Peach leaved Willow	FACW
<i>Salix exigua</i>	Coyote Willow	OBL
<i>Scirpus americanus</i>	Chair maker s Rush	OBL
<i>Scirpus validus</i>	Great Bulrush	OBL
<i>Setaria viridis</i>	Green Foxtail	NL
<i>Sonchus arvensis</i>	Sow thistle	FAC
<i>Taraxacum officinale</i>	Dandelion	FACU
<i>Typha latifolia</i>	Common Cattail	OBL
<i>Verbena bracteata</i>	Bracted Vervain	FACU
<i>Veronica americana</i>	Brooklime	OBL
<i>Xanthium strumarium</i>	Cocklebur	FAC

- (1) Indicator categories were obtained from the National List of Plant Species that Occur in Wetlands Colorado (Reed 1988) The Region 5 Indicator (R5IND) was used Region 5 includes Nebraska Kansas and Eastern Colorado

INDICATOR CATEGORIES

OBL (Obligate Wetland) Occur almost always (estimated probability > 99 /) under natural conditions in wetlands

FACW (Facultative Wetland) Usually occur in wetlands (estimated probability 67 / 99 /) but occasionally found in nonwetlands

FAC (Facultative) Equally likely to occur in nonwetlands (estimated probability 34 / 66 /)

FACU (Facultative Upland) Usually occur in nonwetlands (estimated probability 67 / 99 /) but occasionally found in wetlands (estimated probability 1 / 33 /)

UPL (Obligate Upland) Occur in wetlands in another region but occur almost always (estimated probability >99 /) under natural conditions in nonwetlands in the region specified
If a species does not occur in wetlands in any region it is not on the National List

NL (Not On List) Species is not listed on region 5 list It may be on the National List in other regions

NI (No Indicator) Insufficient information was available to determine an indicator status